FCC 95-287

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band, to Reallocate the 29.5 - 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services	)	CC Docket No. 92-297
and	)	
Suite 12 Group Petition for Pioneer's Preference	)	PP-22

THIRD NOTICE OF PROPOSED RULEMAKING AND SUPPLEMENTAL TENTATIVE DECISION

Adopted: July 13, 1995 Released: July 28, 1995

Comment Date: August 28, 1995
Reply Comment Date: September 18, 1995

By the Commission:

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I. INTRODUCTION

1. This is the Third Notice of Proposed Rulemaking in our proceeding to establish Local Multipoint Distribution Service (LMDS) in the 27.5 - 29.5 GHz (28 GHz) frequency band.[1] In this Notice, we propose a band segmentation plan that we tentatively conclude will permit both LMDS and Fixed Satellite Service (FSS) systems to operate in the 28 GHz frequency band. We also propose to accommodate feeder links for certain Mobile Satellite Service (MSS) systems in this band.

2. The proposal ensures the rapid dissemination of innovative communications services by facilitating the entry of multiple providers into the market. New providers will offer facilities-based competition to each other and traditional cable and telephone carriers -- greatly enhancing customer choice. A wealth of innovative services will include two-way video, teleconferencing, telemedicine, telecommuting, data services and global networks. Flexible service rules will also promote the efficient use of scarce spectrum by allowing providers to adjust and respond to changes in technology and market demand.

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[1] *In the Matter of Rulemaking to Amend Part 1 and Part 21 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service*, Notice of Proposed Rulemaking, Order, Tentative Decision and Order on Reconsideration, 8 FCC Rcd. 557 (1993)(hereinafter "*First NPRM*"), *recon. pending*; Second Notice of Proposed Rulemaking, 9 FCC Rcd 1394 (1994)(hereinafter "*Second NPRM*").

3. Developers of LMDS fixed microwave service propose to offer broadband two-way video communications, including video distribution, teleconferencing, telemedicine, telecommuting, and data services using a cellular system design to establish communications links with subscribers. LMDS proponents hope to provide high quality competition to cable operators and local exchange carriers. LMDS' cellular-like capabilities enable it to offer diverse services within the same region.

4. FSS systems, using state of the art technology, propose to offer a range of domestic and international services, including telephone, video, teleconferencing, and interactive data services. The proposal will provide bandwidth to connect seamlessly satellites and terrestrial fiber networks. Feeder links for MSS systems operate in the FSS frequency bands, and are needed to complete the transmission paths to enable these services to be available to mobile users.

5. In this Notice we propose the use of competitive bidding to choose among mutually exclusive LMDS and FSS applicants. We are also addressing the 29.5-30.0 GHz band in this docket. It is necessary to consider this band segment simultaneously with the 27.5 - 29.5 GHz band because our band segmentation proposal for the latter band anticipates providing spectrum for geostationary FSS at 29.5 - 30.0 GHz.

6. Finally, we are supplementing our earlier Tentative Decision on CellularVision's request for a Pioneer Preference. This supplement to our earlier proposal is necessitated by events occurring since the issuance of our First Notice of Proposed Rulemaking.

II. BACKGROUND

7. The 27.5 - 29.5 GHz frequency band is currently allocated for fixed, fixed-satellite uplinks, and mobile services. 47 C.F.R. § 2.106. Part 21 of the Code of Federal Regulations permits fixed point-to-point use, and Part 25 of the Code of Federal Regulations permits fixed satellite services in this band. Except for experimental work in this band conducted by the predecessor-in-interest of CellularVision of New York, L.P., (hereinafter "CellularVision"), which began in 1986,[2] very little fixed demand for the spectrum existed prior to 1991. Similarly, except for NASA's experimental Advanced Communications Technology Satellite (ACTS) and Norris Satellite Communications's (Norris) 1990 application, little demand for fixed-satellite uplinks appeared to exist.

8. In 1990, Motorola Satellite Communications, Inc. (Motorola) applied for feeder links for its non-geostationary mobile satellite (Big-LEO) system in this band. On July 16, 1990, Norris filed an application to provide satellite services in the 29.5-30.0 GHz band. In January, 1991, the Commission granted the application of CellularVision's predecessor-in-

[2] Experimental Radio Station KA2XLG; *See also* Comments, Suite 12 Group, at page 50, filed March 16, 1993.

interest, Hye Crest, Inc., for a license to provide LMDS in the 27.5 - 28.5 GHz frequency band covering the New York City Primary Metropolitan Statistical Area (NYPMSA).[3] The application was granted pursuant to waiver of the point-to-point rules in Part 21 in order to allow a fixed cellular point-to-multipoint operation for video distribution (wireless cable).[4] The CellularVision system is operating in the Brighton Beach area of the NYPMSA, and CellularVision has requested authority to expand within its assigned service area. The licensee is also planning to implement telecommunications service. Approximately 975 applications similar to that of Hye Crest's were filed between February, 1991 and October, 1992 requesting waiver of the point-to-point rules so that point-to-multipoint service could be offered.[5] The Commission implemented a freeze on new applications for the Common Carrier Point-to-Point Service in the band 27.5 - 29.5 GHz in October, 1992.[6] The freeze was intended to stop the filing of waiver applications, and it remains in effect.

9. NASA has invested nearly one billion dollars in the in-orbit NASA Advanced Communications Technology Satellite (ACTS) system. The project has demonstrated it is feasible to provide a variety of fixed-satellite services in the Ka-band, including integrated services digital networks (ISDN), supercomputer access, and rural electric power monitoring and operations. Specifically, the ACTS system has provided the opportunity for the Mayo Clinic to diagnose patients in remote locations and the opportunity for the U.S. military to conduct overseas communications during Operation Uphold Democracy in Haiti. NASA is operating ACTS under a frequency usage support agreement from National Telecommunications and Information Administration (NTIA). The agreement is accorded experimental status by the Federal Communications Commission.

10. This rulemaking proceeding was preceded by three petitions for rulemaking concerning the 28 GHz band. Harris Corp-Farinon Div. filed a petition for rulemaking requesting that the Commission channelize the 28 GHz band so that manufacturers of point-to-point equipment could standardize their systems. CellularVision filed a petition for rulemaking to change the point-to-point rules in a manner consistent with its waiver so that point-to-multipoint video distribution service could be offered on a regular basis in the band. In response to CellularVision's petition, Video/Phone Systems, Inc. (Video/Phone) filed a petition for rulemaking proposing a broadband-on-demand video telecommunications service.

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[3] *Hye Crest Management, Inc.*, 6 FCC Rcd 332 (1991).

[4] The licensee was granted waivers of Sections 21.108 (directionalization and bandwidth requirements) and 21.700 (status eligibility).

[5] The Commission denied the waiver requests and dismissed the applications in the *First NPRM*. Reconsideration petitions of this action are pending.

[6] *In the Matter of Petitions for Redesignation of the Common Carrier Point-to-Point Microwave Radio Service Frequency Band 2.5 GHz - 29.5 GHz*, Order, 7 FCC Rcd 7201 (CCB 1992).

11. The *First NPRM* was released January 11, 1993. 8 FCC Rcd. 557. In it, the Commission considered the three petitions for rulemaking. The Commission tentatively concluded that redesignation of the fixed point-to-point use of the band to fixed point-to-multipoint could stimulate greater use of the 27.5 - 29.5 GHz frequency band, and proposed detailed rules (other than technical requirements) for implementation of a Local Multipoint Distribution Service. The Commission did not specify what type of service would have to be offered, preferring that the marketplace decide the best use of the spectrum.

12. The Commission proposed two blocks of 1000 MHz each for Local Multipoint Distribution Service. This proposal was based on CellularVision's existing technology.[7] However, because the 27.5 - 29.5 GHz frequency band is allocated on a co-primary basis with the Fixed Satellite Service for uplinks, the Commission also requested comment from satellite entities regarding the effect of redesignation and the proposed rules on any proposed satellite use of the band.

13. In response to the *First NPRM*, a number of different uses were proposed for terrestrial and satellite licensing. The Commission considered the various proposals for the 28 GHz band and released the *Second NPRM* on February 14, 1994 (9 FCC Rcd 1391). In it, the Commission found that the majority of commenters and reply commenters supported the Commission's finding of widespread interest in point-to-multipoint uses of the 28 GHz band, but also found significant interest on the part of the satellite industry in the band. Accordingly, the Commission tentatively concluded that the best interests of the public would be to allow both terrestrial and satellite providers to co-exist in the 28 GHz band, and decided to begin a negotiated rulemaking procedure to develop technical rules for sharing the band. After public notice and opportunity to comment, and with the approval from the Office of Management and Budget and the General Services Administration, the Commission established the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee (NRMC).

14. The LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee met between July 26, 1994 and September 23, 1994; the Report of the Committee, dated September 23, 1994, was presented to the Commission and is included in the docket of this proceeding.

15. The results of the Committee's work indicate that LMDS and FSS service uplinks (*i.e.*, the ubiquitous subscriber transceivers) are not technically able at this time to reasonably share the same spectrum. However, CellularVision and Motorola were able to reach agreement on technical parameters allowing LMDS and feeder links to non-geostationary satellites operating in the Mobile-Satellite Service to share the same spectrum, subject to feasible sharing criteria. There was some indication that limited sharing could be

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[7] CellularVision, by virtue of its license pursuant to waiver of the existing point-to-point rules, is the only operator licensed to provide LMDS in the United States; it is operating a system in Brighton Beach, New York City. CellularVision and Texas Instruments have operating systems in other countries. Other LMDS developers are testing prototypes and components. A number of LMDS developers have experimental licenses.

achieved between FSS gateway stations[8] (either non-geostationary or geostationary orbit) and LMDS.

16. In the following text, we describe the characteristics of the particular systems proposed. Each of these systems has particular technical characteristics which may render it more suitable for some types of uses or services than other systems. Each also is, in our view, a potentially critical component of both the national and global information infrastructure. Each system description should be read bearing in mind that our ultimate goal is to accommodate the strengths of systems so that, through private investment, competition and ubiquitous service result.

A. Specific Satellite Proposals

17. Permitting satellites to operate in the 28 GHz band will contribute to the national and global information infrastructure by modernizing existing communications infrastructures of local telephone service, providing enhanced wide-area mobile services and access to advanced, digital, broadband communications and video services. These advanced services can potentially be provided to every person in the world, whether in an urban or remote location. As a consequence, satellites have significant potential to stimulate economic growth in the United States and abroad. The United States has led the world in developing and implementing satellite technology and the satellite proposals before us represent an opportunity for the United States to continue its leadership role through enhanced communications infrastructures and services.

18. Three types of satellite system uses have been proposed for the 28 GHz frequency bands. First, the Commission has received applications for geostationary fixed satellite service (GSO/FSS) licenses. Second, the Commission has received one application for a non-geostationary fixed satellite service (NGSO/FSS) system. Finally the Commission has multiple requests for the assignment of feeder links to be used in conjunction with non-geostationary mobile satellite service (NGSO/MSS) systems, including specific requests for assignment of frequencies in the 28 GHz band, as well as conditional requests that 28 GHz frequencies be made available for feeder links in the event feeder link assignments cannot be made in other bands. We address each of these types of satellite uses.

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[8] Gateways are earth stations generally larger than user terminals that support multiple carriers. These stations provide interconnection with the terrestrial Public Switched Network. By their nature, they are not deployed in the same ubiquitous way as the user transceivers.

1. *Geostationary Fixed-Satellite Service Proposals*[9]

19. Hughes Communications Galaxy, Inc. (''Hughes'') submitted an application in December 1993 to construct, launch and operate two domestic fixed-satellites to operate in the Ka-band, a system which it calls ''Spaceway.'' Hughes later amended this application to expand the system to 17 interconnected satellites with global coverage. Four of these satellites are proposed to serve the United States. These four satellites serving the U.S. would use 1000 MHz of spectrum at 29.0 - 30.0 GHz for uplinks.[10] Hughes proposes to provide low-cost, ubiquitous, high-speed data, video, and videotelephony communications services. Spaceway proposes to offer United States domestic service, domestic service within other countries, intra-regional service, and global international services. The services will be available ''on demand'' with an estimated domestic satellite capacity of 21,650 simultaneous duplex 384 Kbs channels and 92,000 such channels system wide. The first satellites in the Spaceway network are scheduled to be operational in 1998.

20. Hughes proposes to co-locate two of the four domestic satellites at 101 degrees W.L. and the other two at 99 degrees W.L. Hughes plans to operate each of the co-located satellites over 500 MHz of spectrum, with one operating in the 29.0-29.5 GHz band and the other in the 29.5-30.0 GHz band. Each proposed satellite will incorporate forty-eight 120 MHz spot beams for uplink and downlink communications, twenty-four in each polarization direction. By proposing multiple satellites at each of the orbital locations, Hughes represents the Spaceway network will be able to use power levels that will allow customers to use small, inexpensive earth terminals. By proposing two satellites at two locations, instead of one satellite at four different locations, more geostationary satellites will be accommodated and spectrum efficiency is enhanced.

21. Loral Aerospace Holdings, Inc. (''LAHI'') filed an application in April 1995, requesting authority to construct, launch, and operate a Ka-band geostationary fixed satellite, ''CyberStar.'' CyberStar would use 1250 MHz at 28.75 GHz to 30.0 GHz for satellite

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[9] The Commission issued Norris Satellite Communications, Inc. (''Norris'') authority in July 1992, to construct, launch and operate a fixed-satellite service system in the 29.5-30.0 GHz band. *See Norris Satellite Communications, Inc.*, 7 FCC Rcd 4289 (1992). In granting Norris's application, we waived our financial qualification standard in light of the facts that no other application was then pending for use of the 28 GHz band, and that Norris's satellite would not preclude other uses of the band, since ''the entire orbital arc remains available for future applicants.'' 7 FCC Rcd at 4290. We also imposed construction milestones and indicated they would not be routinely extended. The milestones require Norris to begin construction of a satellite by July 1993, complete construction by September 1996, and launch the satellite by January 1997.

[10] Hughes proposes to use frequencies from 19.2 to 20.2 GHz for downlinks in the U.S.

uplinks, to serve the contiguous United States, Alaska, and Hawaii.[11] LAHI proposes to locate Cyberstar at 110 degrees W.L. LAHI's proposed system will consist of 20 regional high-powered spot beams with cross-polarization, each of which is individually designed for efficient coverage and minimal signal degradation due to rain attenuation. The proposed satellite is specifically designed to provide compressed high data rate digital signals in the Ka-band frequency to both commercial and residential users. Proposed services include video telephony and videoconferencing, medical and technical tele-imaging, computer aided design/computer aided manufacturing (CAD/CAM) data, and image transmission.

22. In April 1995, PanAmSat Licensee Corporation (''PanAmSat''), filed an amendment to its application to construct, launch, and operate a new hybrid geostationary fixed-satellite, PAS-9, as part of its separate international communications satellite system. In this amendment, PanAmSat requests 2500 MHz of the Ka-band, at 27.5-30.0 GHz for satellite uplinks, as a component of its proposed system.[12] PAS-9, which PanAmSat proposes to operate at 58 degrees W.L., is to serve the United States and other countries through movable Ka-band spot beams. Services provided by PAS-9 would include two-way Direct-to-Home (DTH) and other advanced VSAT services to small antenna networks.[13]

2. Non-Geostationary Fixed Satellite Service Proposals

23. Teledesic Corporation filed an application in March 1994 for authority to construct, launch, and operate a constellation of low-Earth orbit (LEO) satellites in the fixed-satellite service. An amendment to that application was also filed in December 1994. Teledesic proposes to operate a constellation of 840 satellites, with 40 active satellites evenly spaced in each of 21 orbital planes in the 28 GHz band. The system will provide ''constant'' coverage to over 95% of the Earth's surface through a fixed grid of approximately 20,000 160km squares or ''super cells.'' Teledesic requests authority to operate using 400 MHz for service links, 800 MHz for gateway-to-satellite feeder links, and 100 MHz for mobile services.[14]

24. Teledesic's proposed services include: providing universal access, at a cost that is independent of location; ISDN; voice; facsimile; two-way digital data; videoconferencing; interactive multi-media; and other broadband types of services which allow the user to access only the amount of bandwidth needed for a particular application (''Bandwidth on Demand'').

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[11] LAHI proposes to use 18.95 to 20.20 GHz frequency bands for its downlinks.

[12] PanAmSat proposes to operate its downlinks in the 17.7 to 20.2 GHz frequency band.

[13] We also note that on July 12, 1995 Ka-Star Satellite Communications Corporation filed an application for a geostationary fixed satellite system.

[14] Teledesic proposes to use frequencies from 17.8 GHz to 18.6 GHz and 18.8 GHz to 19.2 GHz for its downlinks.

Teledesic offers to dedicate some of the capacity of the Teledesic global satellite system on a non-profit basis for developing countries' needs, such as education and health care.[15]

3. Non-Geostationary/ Mobile Satellite Services (NGSO/MSS) Feeder Links

25. Big LEO systems are satellite systems capable of providing on a global basis both voice and data mobile satellite services using handheld terminals. The communications link between the satellite and these mobile terminals is referred to as the service link. Another and integral part of a Big LEO system is its feeder links. These are the transmission links to and from the satellite to a central earth station. The feeder link is needed to interconnect the mobile satellite system with other communications networks or with other user transceivers. Without this link, Big LEO systems will not be able to initiate service.

26. Since the *Second NPRM*, the Commission has licensed three Big LEO systems.[16] The Commission also found that two other applicants needed additional time to establish they were financially qualified, and deferred further consideration of their applications until January 31, 1996.[17] Another applicant elected to defer its financial showing until January 31, 1996. Two of the licensees proposed to locate feeder links in the Ka-Band, and were granted authority to construct satellites, at their own risk, with feeder links in the band.[18] Specifically, Motorola was conditionally authorized to construct feeder uplinks in the 29.1-29.3 GHz band, and feeder downlinks in the 19.4-19.6 GHz band. Motorola's licensed Big LEO system, Iridium, is under construction and is scheduled for launch in 1996. TRW, another Big LEO licensee, was conditionally authorized to construct feeder uplinks in the 29.7-30.0 GHz portion of the band, and feeder downlinks in the 19.8-20.1 GHz frequency bands. Although proposed as a band for MSS feeder links in the ITU Study Group Process, this band was not

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[15] By non-profit, Teledesic means it will not seek to generate revenue from these services. Teledesic's Chairman made this announcement at the G-7 Ministerial Conference in Brussels, on February 24, 1995.

[16] *See Loral/Qualcomm Partnership, L.P.*, 10 FCC Rcd 2333 (Int'l. Bur. 1995); *Motorola Satellite Communications, Inc.*, 10 FCC Rcd 2268 (Int'l. Bur. 1995); *TRW Inc.*, 10 FCC Rcd 2263 (Int'l. Bur. 1995). These orders are each subject to a petition for reconsideration or an application for review.

[17] *Constellation Communications, Inc.*, 10 FCC Rcd 2258 (Int'l. Bur. 1995); *Mobile Communications Holdings, Inc.*, 10 FCC Rcd 2274 (Int'l. Bur. 1995). These orders are each subject to a petition for reconsideration or an application for review

[18] The licensing orders indicated that authority to launch and operate a system using the conditionally authorized feeder links would be withheld until sufficient spectrum is available to satisfy the feeder link requirements of all licensed Big LEO systems. *Motorola Satellite Communications, Inc.*, 10 FCC Rcd 2268, at para. 17 (Int'l. Bur. 1995); *TRW Inc.*, 10 FCC Rcd 2263, at para. 15 (Int'l. Bur. 1995).

listed as a potential MSS feeder link band in subsequent preparations for the WRC-95.[19] Therefore, we are considering other segments of the Ka band as candidates to accommodate TRW's proposal.[20] Other licensees and applicants have also asked for feeder link spectrum outside the Ka-Band, but have indicated that, depending on the availability of that spectrum worldwide, they may wish to modify their proposals.

B. Specific LMDS Proposals

27. LMDS may provide services that compete with local exchange carriers in the provision of local exchange service, and with cable operators in the provision of video programming. LMDS developers and manufacturers, especially CellularVision, have provided for the record complete system designs and descriptions of their proposed services and the projected consumer interest in these services. Very high subscriber capacity for two-way video telecommunications is available through technology developed for use in this frequency band. Hub transceivers create small cells, typically of six miles diameter, which transmit to subscriber locations, and which can receive subscriber transmissions on a return path. Because the cells are small, and arranged in a typical cellular pattern, a very high level of frequency reuse is possible. This pattern, combined with the availability of broadband microwave spectrum, results in sufficient capacity in the proposed LMDS system designs to provide wireless competition to local exchange carriers or cable television systems even in urban areas. Service in competition to cable television providers is now being offered in the Brighton Beach area of New York City, pursuant to a license to CellularVision, Inc. A single cell of six miles diameter is serving 1700 subscribers.[21]

28. LMDS, as developed since the *First NPRM* was released, joins services traditionally provided by separate communications service providers, such as cable television, telephony, video communications, data transfers, and interactive transactions of all types. In addition, based on the interest generated in LMDS by entrepreneurs in this country, LMDS has attracted attention and support from both developed and developing countries around the world. LMDS manufacturers CellularVision and Texas Instruments have begun video and telephony services in other countries using LMDS technology. At least seven other countries, including Canada and Mexico, have licensed LMDS on an experimental or permanent basis in

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[19] *See CPM Report on Technical Operational and Regulatory/ Procedural Matters to be Considered by the 1995 World Radio Communication Conference*, (CPM Report), Table 15 (Geneva 1995).

[20] *See infra*, n. 61 and accompanying text for a discussion of "reverse band working" in the 19.4 - 19.7 GHz band.

[21] *Ex parte* notice letter, Michael Gardner, P.C., to William Caton, Acting Secretary, Federal Communications Commission, June 26, 1995.

the 28 GHz band.[22] LMDS developers offer the prospect for modern wireless telephone systems, video distribution, and other communications services to developing countries which do not have a wireline or cable infrastructure.

1. CellularVision's System

29. CellularVision states that the technology it proposes is "capable of immediately providing interactive high quality video, voice, and data services. . . ."[23] It argues that LMDS will help meet the public demand for additional multichannel video programming and for two-way voice and data service. CellularVision argues that the public will benefit from having an "innovative and competitive two-way interactive communications system" capable of providing the equivalent of fiber cable service without the need to wire a community,[24] and that LMDS is capable of providing simultaneous telephone service to 75% - 90% of the population of the United States.[25] CellularVision also states that its system is capable of incorporating future technological advances such as high definition television and two-way digital communications.[26]

30. CellularVision has stated that its requirement to compete successfully with cable operators is 1 gigahertz of contiguous spectrum. CellularVision's analog system is a multicell configured distribution system with a return path capability. The video channels (20 MHz) are transmitted over 1 gigahertz of spectrum with the same polarization. Two-way communication channels are inserted between the video channels and are transmitted with opposite polarity. The system uses an omni-directional antenna to transmit from the node, or center of the cell. The subscriber's receiver antenna uses a narrow beamwidth to eliminate multipath reception and to obtain sufficient link margin for service. Each cell is designed to be between 6 to 12 miles in diameter, and shadowed areas are served with a repeater or reflector. The system avoids interference between adjacent cells by cross-polarizing the signals and by taking advantage of the discrimination provided by the subscriber receiving antenna. CellularVision states that its system makes exceptionally efficient use of the frequency spectrum.[27]

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[22] *Ex parte* notice letter, Michael Gardner, P.C., to William Caton, Acting Secretary, Federal Communications Commission, February 16, 1995; *ex parte* notice letter, Texas Instruments, Inc., to William Caton, June 1, 1995.

[23] *Petition for Rulemaking*, Suite 12 Group; see *First NPRM*, 8 FCC Rcd at 558.

[24] *Id.*

[25] *Ex parte* notice letter, Michael Gardner, P.C., to William Caton, Acting Secretary, Federal Communications Commission, March 16, 22, and 28, 1995, attachment, page 2.

[26] *Petition for Rulemaking*, Suite 12 Group; see also 8 FCC Rcd at 558.

[27] *Id.*

2. Texas Instruments' System

31. The Texas Instruments LMDS system is a two-way digital system providing video, data and telephony services. The Texas Instruments system is designed to operate using 1 gigahertz, and the company believes that it requires 1 gigahertz of spectrum to be competitive with landline facilities; however, this spectrum need not be contiguous. The system design consists of hubs, customer premise equipment and central office servers for video and data. The system is based on a cellular design with a typical cell size of 3 miles capable of serving 16,000 subscribers. Each hub employs several sector wide-beam antennas and provides 1,000 simultaneous two-way voice channels, 56 video broadcast channels, and 200 video on demand channels per sector. Each subscriber location employs a highly directional antenna and, in addition to its video capability, will have a 64 kbps data port and two telephone lines. Isolation between hub transmissions in adjacent cells is achieved by the directionality of the antennas and cross-polarization isolation.

3. Video/Phone's System

32. Video/Phone believes that its system also requires 1 gigahertz of spectrum to be viable. The record does not contain a statement of whether Video/Phone's technology requires contiguous spectrum. Its architecture incorporates optional modulation techniques to provide a variety of one-way and two-way voice, data and video services. Video/Phone plans new two-way broadband applications such as distance learning, telecommuting, telemedicine, videoconferencing at high-speed data rates, business and professional television, half-duplex database services, and metropolitan area LAN interconnection. Hub density, intended cell coverage radius (0.5 mile), the degree of cell sectorization, Equivalent Isotropic Radiated Power (EIRP) levels, and other parameters in a typical Video/Phone deployment will vary according to service demand and interference environment conditions. The system may also employ hub diversity in some configurations to allow users to orient antennas toward multiple hub locations, as well as dynamic channel assignment and other operational capabilities.

III. BAND SPLITTING PROPOSAL

33. In the Second Notice of Proposed Rulemaking, the Commission found that if parties were unable to find a technical solution to sharing the 28 GHz band in the Negotiated Rulemaking Committee, the Commission would propose a band plan for public comment.[28]

34. In this Notice, we propose a band segmentation plan. This plan is based on the filings in the proceeding and meetings with individual parties to this proceeding. Furthermore, we have attempted to design a band segmentation plan that will meet our goal, stated in the *Second NPRM*, of accommodating all the types of proposed services for this frequency band. Although we stated that goal in the context of seeking a technical sharing

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[28] *See Second NPRM*, 9 FCC Rcd 1394 (1994).

solution to the different services proposed, we are convinced that denying one or the other of the proposed services is not in the public interest.[29] Both terrestrial and satellite services bring the promise of competition and new services to the nation's communications infrastructure.

35. In the *Second NPRM* we stated that we could make our selection among service proposals on the basis of certain factors. Among these factors were economic growth potential and public interest concerns that may not be readily calculable in economic terms. Accordingly, if any party believes that its service requirements are not adequately satisfied by our proposed band segmentation plan, it should also address the factors stated in the *Second NPRM*.[30] In addition, any commenter asserting that the plan does not provide sufficient capacity for its system, must specify the minimum spectrum required to support its system, supporting this assertion with a concrete technical and economic analysis, and must propose a plan that accommodates the reasonable requirements of all qualified applicants.

36. The Commission contemplated different options for licensing the band and analyzed various sharing proposals submitted in developing our plan. One of the options proposed by parties was to move one service to the 40 GHz band and allow the other service to use the 28 GHz band. The United Kingdom's Radiocommunications Agency believes: "[t]hat the market conditions and technological developments for MVDS [Multipoint Video Distribution Service] are ripe for deployment at 40 GHz, which is a frequency band clear of other spectrum resource pressures internationally."[31] However, we tentatively conclude that the 40 GHz band is not suitable for LMDS as proposed in this docket. Internationally and in the United States the 40.5 to 42.5 GHz band is allocated for fixed services on a secondary basis to broadcast satellite services. In addition, LMDS proponents CellularVision, Texas Instruments and Pacific Telesis state that moving LMDS to the 40 GHz band will result in delays in deployment of LMDS of 12-18 months.[32] These parties also stated that the cost of moving LMDS operations to the 40 GHz band would result in a cost increase sufficient to make LMDS not commercially viable.

37. Likewise, we tentatively conclude that the 40.5 to 42.5 GHz band is not suitable for the satellite systems as proposed in this docket. This band is not internationally or domestically allocated for fixed satellite service operation. Satellite proponents were also concerned that moving their particular service to 40 GHz would delay implementation of their

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[29] *Id.* at 1397.

[30] *Id.* at 1401.

[31] *See ex parte* filing in CC Docket No. 92-297 and ET Docket 94-124, by the Radiocommunications Agency, May 12, 1995.

[32] *See ex parte* filing of Pacific Telesis in ET Docket No. 94-124 and CC Docket No. 92-297 (March 20, 1995), and *ex parte* filing of CellularVision in ET Docket No. 92-124 and CC Docket No. 92-297 (April 18, 1995).

service since technologies have not been fully developed and tested at 40 GHz, as they have been at 28 GHz. We recognize these concerns.

38. Since our proposal accommodates both services at 28 GHz, we need not decide which service would be better suited for operating at 40 GHz. This does not preclude any future determination to allocate spectrum for either service at 40 GHz.[33]

A. Co-Frequency Sharing

39. As mentioned previously,[34] we established a Negotiated Rulemaking Committee, with representatives from each proposed service, and the Commission participating, to try to develop a sharing plan that would accommodate LMDS systems, FSS systems, and feeder links for MSS systems.[35] After two months, the negotiations ended without consensus on a technical sharing arrangement that would accommodate all. The Committee concluded that it was not feasible for LMDS stations and the ubiquitous FSS user transceivers to share the same frequencies.[36] There was also an indication that limited sharing could be achieved between gateway access to the FSS (either NGSO or GSO) and LMDS.[37] In addition, Motorola, CellularVision, and Texas Instruments developed a technical sharing agreement allowing LMDS and MSS feeder links to share the same spectrum with certain constraints.[38]

40. Bell Communications Research (Bellcore) and Geowave each submitted studies, after the conclusion of the meetings held by the Negotiated Rulemaking Committee, that they contend demonstrate that co-frequency sharing between LMDS and FSS systems is possible.[39] Bellcore concluded that co-frequency sharing was feasible with a 99.9% availability for both services, if (1) LMDS systems were modified to increase their interference tolerances; and

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[33] *See In the Matter of Amendment of Parts 2, 15, and 21 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications,* ET Docket No. 94-124.

[34] *See* discussion in the Background section regarding the Negotiated Rulemaking Committee.

[35] *See* Appendix A for a list of participants on the Negotiated Rulemaking Committee.

[36] *See* "Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee" (September 23, 1994) at 85.

[37] *See* Letter from W. Luther, FCC Industry Advisory Committee Facilitator, to K. Wallman, Chief, Common Carrier Bureau, FCC, Sept. 23, 1994.

[38] *Id.* at Appendix 7, p. 2 and discussion on LMDS and MSS feeder link sharing at paras. 60 - 63, *infra.*

[39] *See* "Interference Analyses for Co-Frequency Sharing of the 28 GHz Band by the Local Multipoint Distribution Service (LMDS) and the Fixed Satellite Service (FSS)" ("Bellcore Study")

(2) if the LMDS and FSS operators used a spectrum assignment protocol in which assignments were based upon LMDS operator preferences.

41. MITRE Corporation and NASA submitted filings disputing Bellcore's methodology. Both concluded that sharing is not, in fact, feasible.[40] MITRE and NASA argue that Bellcore's study did not consider, among other things, LMDS systems besides CellularVision and Texas Instruments; FSS systems besides Teledesic and Spaceway; the aggregate interference potential of Teledesic and Spaceway; interference from satellite services into the LMDS subscriber-to-headend link, and interference into adjacent LMDS cells.[41] They also contend that Bellcore's approach obscures the effects of interference on specific LMDS subscribers[42] and appears to be based on "best-case" values, not "worst-case" as described. Both are also concerned about the impracticality of the proposed spectrum protocol.[43] We tentatively conclude that these concerns are valid.

42. In its study, Geowave proposes a sharing protocol under which digital LMDS hubs activate only when a satellite is not transmitting to that area.[44] According to Geowave, this can be accomplished by including a synchronization mechanism on the LMDS hub transmitters. The timing mechanism would "turn off" the LMDS hub when satellite earth stations in the cell area were transmitting to the satellite. This study has been the subject of criticism on the grounds that it has not addressed all interference scenarios, nor does it take into account analog LMDS systems. The sharing methodology, for example, is specific to the Teledesic "grid" system. In order to work, the United States would need to be divided into "cells" that are an exact match to those being projected on the Earth by Teledesic. Further, LinCom Corporation, in its review of the GeoWave proposal states that adjacent cell interference into LMDS subscribers has not been taken into account.[45]

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[40] *See ex parte* filing by the SBCA, " Critique of the Bellcore Report," filed June 9, 1995. The MITRE Corporation's report was prepared under contract with the Satellite Broadcasting and Communications Association ("SBCA"), and was submitted on behalf of the Global Satellite Communications Coalition. See also NASA *ex parte* filing on June 7, 1995.

[41] *See* Critique of the Bellcore Report at viii.

[42] *See ex parte* filing of NASA filed June 7, 1995.

[43] *Id.*

[44] *See ex parte* filing of Geowave "Spectrum Sharing at 28 GHz Using Spatial and Temporal Synchronization and a New Digital LMDS System," February 23, 1995.

[45] *See ex parte* filing of LinCom Corporation, "Review of GeoWave Proposal for the Co-Frequency Sharing of the 28 GHz Band by the Local Multipoint Distribution Service (LMDS) and the Fixed Satellite Service (FSS)," June 28 1995.

43. Based on the existing record, we tentatively conclude that co-frequency sharing between NGSO/FSS or GSO/FSS systems and LMDS systems is not feasible at this time. We further tentatively conclude that Bellcore and Geowave studies do not provide a basis for rejecting the conclusion of the Negotiated Rulemaking Committee regarding the infeasibility of sharing. For example, among the issues raised concerning the Bellcore study, we are particularly concerned about whether the study deals adequately with potential interference cases and with the workability of spectrum assignments that may need to accommodate large numbers of LMDS operators and FSS transmitters. We seek comment on these tentative conclusions. Based on these tentative conclusions, we propose in this Notice a band segmentation plan that divides the 27.5-29.5 GHz frequency band into discrete spectrum segments with each segment designated to FSS, MSS feeder links or LMDS, on a primary or co-primary basis.

B. Commission Proposal

44. We propose a segmentation scheme for the 28 GHz band that we believe is equitable, allows licensees to operate viable systems, promotes competition within the band, allows the public to receive service as soon as possible, and provides for future growth of both satellite and terrestrial services. The plan also supports the NII and GII, creates competition to cable, LECs, cellular, and PCS, and continues to promote the U.S. as a leader in satellite technology. We believe this spectrum band plan accommodates the expected needs of all of the parties, although it does not reflect their exact requests. We maintain that each proponent can still develop and operate viable systems within the band, and initiate competitive services. Moreover, this proposal allows both terrestrial LMDS and satellite industries to implement services in the near term.

45. Our proposed plan is depicted graphically as follows:[46]

PROPOSED BAND SEGMENTATION PLAN

27.5 — 28.35 — 28.60 — 29.1 — 29.25 — 29.5 — 30.0 GHz

LMDS fss 850 MHz	**GSO/FSS** ngso/fss 250 MHz	**NGSO/FSS** gso/fss 500 MHz	**MSS FEEDER LINKS & LMDS** 150 MHz	**MSS FEEDER LINKS & GSO/FSS** 250 MHz	**GSO/FSS** ngso/fss 500 MHz

[46] Primary services are listed in capital letters. Lower-case letters indicate secondary services. Primary services in a particular frequency band have equal rights to any other services operating in the same band. Stations operating in primary services are protected against interference from stations of "secondary" services. Moreover, stations operating in a secondary service cannot claim protection from harmful interference from stations of a primary service. 47 C.F.R. §§2.104(d) and 2.105(c).

46. In proposing this plan, we recognize that proponents submitted other band segmentation plans. Although we do not propose to adopt any of these specific plans, each plan was analyzed and considered in developing our proposal. For example, a group of LMDS proponents submitted a revised plan which proposed co-primary sharing between LMDS and NGSO/FSS systems in 150 MHz of the band.[47] We do not propose FSS systems sharing on a co-primary basis with LMDS systems for reasons discussed more fully in connection with the discussion on the Bellcore study.[48] We also note that no service was placed as a secondary user in the 400 MHz of MSS feeder link spectrum due to the co-primary allocations there. Other plans fail to provide adequately for the operational needs of one or more of the proposed systems. For example, a plan submitted by TRW designates 925 MHz to LMDS (200 co-primary with MSS feeder links), 400 MHz to NGSO/FSS, and 875 MHz to GSO/FSS systems, respectively. We do not believe this is sufficient to support either the LMDS or NGSO services, as discussed below.[49] Similarly, a plan proposed by satellite proponents and one LMDS proponent designates 1000 MHz for LMDS services using two non-contiguous 500 MHz blocks, which may increase the cost of some analog LMDS system designs.[50] We do not believe this adequately supports LMDS systems.[51]

1. Primary LMDS Spectrum

47. First, we propose to designate 850 MHz at 27.5 GHz to 28.35 GHz to LMDS, on a primary basis. GSO/FSS or NGSO/FSS systems would be permitted on a secondary basis, with the purpose of providing limited "gateway" type services. We also propose to designate to LMDS 150 MHz of bandwidth on a co-primary basis with MSS feeder links, at

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[47] *See* Revised band segmentation plan filed on May 31, 1995 by Philips Electronics, AEL Industries, Inc., mm-Tech, Inc., Darrin Technologies, CellularVision Technology & Telecommunications, L.P., M/A-COM, Inc., Titan Information Systems, Logimetrics, CTA Partners, Bell Atlantic Corporation, RioVision of Texas, Inc., International CellularVision, and CellularVision of New York ("The Joint Parties"). The first plan submitted by The Joint Parties on May 11, 1995, included frequencies that are not now allocated for commercial satellite services. Our proposed plan only includes spectrum that is allocated to the proponents involved so that service to the public will not be delayed.

[48] *See also* discussion on downlink pairings at para. 58, *infra*.

[49] Spectrum Proposal for 27.5 - 30.0 GHz, filed by TRW, Inc., May 18, 1995.

[50] *But see ex parte* filing of Hughes dated July 3, 1995.

[51] On May 12, 1995, Boeing Company, Hughes Communications, Inc., Teledesic Corporation, and Texas Instruments, Inc., ("The Parties") proposed a spectrum allocation plan. This plan was also supported by NASA, Lockheed Martin, and Hewlett Packard.

29.1 to 29.25 GHz.[52] We believe the planned LMDS services can be supported within this 1000 MHz of spectrum.

48. We have proposed to designate LMDS to the lowest portion of the 28 GHz band because CellularVision is operating a cell at 27.5-28.5 GHz and because LMDS equipment is already manufactured to operate in this frequency range. In doing so, we recognize that some LMDS proponents planning to implement 20 MHz type analog systems sought 1000 MHz of contiguous spectrum at 27.5 to 28.5 GHz. However, Texas Instruments and Hewlett Packard, both LMDS equipment manufacturers, note that a non-contiguous assignment could be used to meet LMDS operators' separate inbound and outbound spectrum needs. Further, we are concerned that designating LMDS more than 850 MHz of contiguous spectrum would not leave sufficient spectrum for other services in the band.

49. Further, although 150 MHz of the 1000 MHz designated for LMDS on a primary basis is shared with MSS feeder links on a co-primary basis, we believe that such co-frequency operations are feasible, as evidenced in part by the fact that parties to the Negotiated Rulemaking Committee were able to reach agreement on sharing between such services.[53]

50. The location of the 150 MHz shared portion, at 29.1 to 29.25 GHz, is dictated by the proposed frequency for Motorola's feeder links. Because we tentatively conclude that we cannot designate more than 850 MHz of contiguous spectrum to LMDS at the low end of the band, we believe that designating the additional 150 MHz requested by LMDS applicants at 29.1 to 29.25 GHz is a reasonable compromise.

51. Harris Corporation-Farinon Division (Harris) and Digital Microwave Corporation (Digital) filed a Petition for Rulemaking "In the Matter of Amendment of Parts 2, 21 and 94 of the Commission's Rules Concerning Channel Assignments in the 27.5 - 29.5 GHz Band." Harris and Digital were represented on the Negotiated Rulemaking Committee and have participated in the entire proceeding of this docket, including the discussions on the band segmentation issues. Harris and Digital have been concerned that the Commission adopt a channelization plan for the 28 GHz band, and that the band be available under Part 94 of the Commission's rules (for private carriers) in addition to its current availability under Part 21 (for common carriers).[54] As noted in the *First NPRM*, Harris filed a previous rulemaking petition to make that request. The Commission did not propose to specify any channelization plan in the first NPRM, nor did it propose to maintain any of the spectrum solely for point-to-

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[52] *See* discussion relating to sharing between LMDS and MSS feeder links, paras. 60 - 63, *infra*.

[53] *Id.*

[54] If the Commission's proposal in WT Docket No. 94-148 to merge Part 94 and some of Part 21 into a new Part 101 is adopted, Harris and Digital argue that the 28 GHz band should be incorporated into Subparts H and J of the new Part 101.

point use; instead, it proposed to redesignate the 28 GHz band, to the extent that it is used for terrestrial services, for point-to-multipoint services.

52. In this Notice we again decline to dedicate part or all of the 28 GHz band solely to point-to-point services, as requested by Harris and Digital. At this time we believe it is in the public interest to provide terrestrial licensees in the 28 GHz band with the flexibility to offer a variety of services and to develop innovative new services. Harris and Digital have not demonstrated that the public interest in point-to-point services is greater than the interest in the myriad LMDS services proposed by other manufacturers and developers during the course of this proceeding.

53. Entities interested in providing point-to-point services may apply for LMDS spectrum themselves, they may seek geographic partitioning and/or spectrum disaggregation opportunities to the extent that these options are adopted in final LMDS rules, or they may lease spectrum from LMDS operators, to the extent permitted by our rules. Finally, we believe that we have made sufficient point-to-point spectrum available for support of wired and wireless telecommunications systems for the present.[55]

b. Primary GSO/FSS Spectrum

54. Next, we propose to designate 1000 MHz of spectrum on a primary basis to GSO/FSS systems from 28.35 to 28.60 GHz and 29.25 to 30.0 GHz. We also propose to allow NGSO/FSS systems to operate on a secondary basis to GSO/FSS systems in these bands and to allow MSS feeder links to operate on a co-primary basis in the 29.25 to 29.5 GHz band.[56] This matches the request submitted by Hughes for 1000 MHz for operation of Spaceway, its proposed GSO/FSS system. It is, however, less than the amount of spectrum proposed by two other applicants, specifically PanAmSat and Loral. PanAmSat requests 2500 MHz of spectrum for operation of its proposed satellite, PAS-9, which will also operate in the C and Ku bands, and Loral requests 1250 MHz of spectrum for operation of its satellite system, CyberStar. Moreover, this plan assumes GSO/FSS systems and MSS feeder links can operate in the same band.

55. Several factors contribute to designating 1000 MHz of spectrum for the GSO/FSS systems. First, U.S. satellites currently providing fixed-satellite services in the C (4/6 GHz) and Ku (12/14 GHz) frequency bands are required, for spectrum efficiency, to use full frequency reuse, and to operate across the entire 500 MHz of each frequency band in each transmission direction. In response to the increased demand for satellite services, most FSS systems being built today are hybrid satellites, that is, they operate in both the C and Ku bands, thus utilizing 1000 MHz. Currently, the C and Ku bands are heavily utilized. Second, the GSO/FSS systems proposed for operation in the Ka band are proposing broadband

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[55] *Hye Crest Management, Inc.* 6 FCC Rcd 332, para. 23 (1991).

[56] *See* discussion at para. 64, *infra.*

applications. Broadband applications require more bandwidth than current data operations. We therefore believe that 1000 MHz of spectrum is needed to support multiple Ka-band GSO/FSS systems. Further, 250 MHz of this 1000 MHz of spectrum will be shared on a co-primary basis between GSO/FSS systems and MSS feeder links, as explained in more detail below.[57]

3. Primary NGSO/FSS Spectrum

56. We propose to designate 500 MHz of spectrum on a primary basis, at 28.60 to 29.1 GHz, to NGSO/FSS systems. We also propose to allow GSO/FSS systems to operate in this segment on a secondary basis. Teledesic has requested 1200 MHz of spectrum for its system. It proposes to operate user terminals over 400 MHz of spectrum and its gateway or high data rate (GigaLink) terminals over 800 MHz of spectrum.[58] Various technical analyses, submitted to the Commission and to industry preparatory groups for WRC-95, have demonstrated that the ubiquitous deployment of user terminals for a NGSO/FSS system, such as Teledesic's, will receive and cause unacceptable amounts of interference to other satellite users in the frequency band. These same analyses also conclude that the gateway terminals pose fewer problems for coordination than do the user terminals. This means that the user terminals are prime candidates to operate on a primary non-shared basis, and the gateway terminals are prime candidates to operate, for the most part, on a secondary basis in other bands. In particular, we propose secondary NGSO/FSS operations in the 750 MHz of spectrum in the 28.35 to 28.60 GHz and 29.5 to 30.0 GHz bands.[59]

57. We believe designating NGSO/FSS systems to only 400 MHz of primary spectrum, however, could call into question the system's operational ability. Relegating all gateway terminals to secondary status may lead to operational uncertainty. Not only would the gateway terminals bear the burden of coordinating with domestic GSO system operations, but they would be subject to the International Telecommunication Union Radio Regulation 2613, which requires NGSO systems to cease operations if they cause unacceptable interference into a GSO system.[60] Consequently, we propose to designate NGSO/FSS systems 500 MHz on a primary basis. The additional 100 MHz will ensure that at least some spectrum could be used for gateway terminals, and not be subject to secondary user constraints and RR 2613.

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[57] *Id.*

[58] *See* Teledesic's application at 2.

[59] *See* paras. 54 - 55, *supra.*

[60] *See* ITU Radio Regulation 2613. The Commission has proposed that the ITU eliminate NGSO's secondary status, *see* WRC Preparatory Report, FCC 95-256 (released June 15, 1995) at paras. 59-68.

58. Furthermore, the location of the 500 MHz for NGSO/FSS system uplinks at 28.6 to 29.1 GHz is dictated in part by the location of the downlink frequencies contemplated for use. Downlinks at lower frequencies may prove unworkable. Specifically, the downlink spectrum conventionally paired with the 200 MHz immediately below 28.6 GHz, *i.e.* 28.4 to 28.6 GHz, is 18.6 to 18.8 GHz. The 18.6 to 18.8 GHz band is currently being used by space science systems which cannot easily co-exist with a NGSO satellite system. However, the downlink spectrum conventionally paired with the frequency band 28.6 to 29.1 GHz is at 18.8 to 19.2 GHz, which is proposed for NGSO/FSS primary operation. Consequently we propose to designate NGSO/FSS in a frequency band with a conventionally paired downlink.

4. Primary MSS Feeder Link Spectrum

59. We propose to designate MSS feeder links and LMDS systems on a co-primary basis in the 29.1 to 29.25 GHz band segment and MSS feeder links and GSO/FSS systems to operate on a co-primary basis at 29.25 to 29.5 GHz. We also propose that MSS feeder links be authorized on a "reverse band working"[61] basis in the 19.4 to 19.7 GHz band.[62] Motorola has applied for 200 MHz of feeder link spectrum at 29.1 to 29.3 GHz for its Iridium system and TRW has applied for 300 MHz of Ka-band spectrum for its Odyssey system. It may be necessary to accommodate MSS feeder links for more than one system in the Ka-band. We propose to accommodate two systems in the band, and rely on other frequency bands to satisfy the requirements of any additional systems.[63] Time sharing arrangements and geographic diversity, among other mechanisms, could eliminate potential intra-service interference situations.

a. 29.1 to 29.25 GHz (150 MHz)

60. The only agreement reached with respect to frequency sharing during the Negotiated Rulemaking included Motorola, CellularVision, and Texas Instruments.[64] These parties agreed that MSS feeder links and LMDS hub stations and subscriber receivers can operate on the same frequencies subject to certain operating restrictions. The agreement provided that subscriber transceivers would not be permitted to transmit in this shared band. It also permitted the MSS licensee to operate feeder link earth stations in up to eight

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[61] "Reverse band working" involves authorizing satellite communications links in a direction opposite to the direction for which the band is allocated. Thus, in the 19.4-19.7 GHz bands, which are allocated for downlinks, uplinks should operate on a "reverse band working" basis. *See* CPM Report at Chapter 2, Section 1, Part C, § 3.2.5.

[62] This proposal would accommodate TRW's request for 300 MHz of feeder link spectrum for the Odyssey system.

[63] *See* discussion *infra* on effect of decisions at WRC-95 on the band segmentation plan.

[64] *See* Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee, Addenda.

designated metropolitan statistical areas (MSAs) without further coordination. These feeder link stations would be afforded a protection zone within the specified MSA and up to 75 nautical miles from its boundary. That is, LMDS receive stations must accept any interference caused to them by these MSS feeder link earth stations within the specified MSA and up to 75 nautical miles within its boundary. We use this agreement as the basis for our co-frequency sharing plan between these services. Also we request comment on how this band sharing plan would be affected if the Commission adopts its proposal to use BTAs, rather than MSA/RSAs, for LMDS licensing.

61. Because Motorola requested 200 MHz of spectrum for Iridium's feeder links, the agreement envisioned 200 MHz of shared spectrum. Our band plan proposes that only 150 MHz of spectrum, between 29.1 and 29.25 GHz, will be shared by MSS feeder links and LMDS systems. If the MSS operator ultimately assigned to operate in this band requires more than 150 MHz of spectrum, those requirements can be satisfied in another band as proposed below.

62. We specifically propose to limit MSS uplinks in the 29.1-29.25 GHz band to eight feeder link earth stations complexes. We propose to require that these feeder link earth station complexes be identified at least 45 days prior to the commencement of any LMDS auctions by submission of a list of the geographic coordinates of protected feeder link earth station complexes.[65] These sites must be chosen in accordance with the following requirements: (1) none of the feeder link earth station complexes may be located in any of the top eight MSAs, ranked by population, as defined by the Office of Management and Budget as of June 1993, using estimated population as of December 1992, (2) two feeder link complexes may be located in MSAs 9 through 25, one of which is in Chandler, AZ, (3) two feeder link complexes may be located in MSAs 26 to 50, and (4) two feeder link complexes may be located in MSAs 51 to 100. The two remaining feeder link sites must be at least 75 miles outside the boundaries of an MSA. The additional technical details of the sharing plan are set out in Appendix B of this Notice.

63. Further, while we do not propose it here, we believe it may be possible to permit LMDS subscriber traffic in the 150 MHz of shared spectrum under certain operating conditions. For example, Texas Instruments says that various methods can be used to reduce interference potential, including designing LMDS customer transceivers to terminate transmissions if not properly oriented or if not signalled by the LMDS hub.[66] Another method to help reduce interference potential may be to require MSS feeder link stations to

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[65] As proposed in the Negotiated Rulemaking Committee agreement, a "feeder link earth station complex" may include up to three earth stations, with each earth station having up to four antennas.

[66] Texas Instruments also believes that LMDS subscriber link transmissions can also be facilitated by using polling algorithms that do not allow transceivers to transmit independent of node communication, using active power control to compensate for rain attenuation, and lowering transceiver power at short ranges to nodes.

operate at a minimum elevation angle of 7 or 8 degrees, rather than the 5 degree elevation angle proposed by Motorola. We request comment on whether, and the extent to which, these sharing methods and others may be used to permit two-way LMDS operations in the frequency band shared with MSS feeder links. Commenters should support their comments with a complete technical analysis and any economic or operational consequences of this alternative proposal.

b. 29.25 to 29.50 GHz (250 MHz)

64. We propose to designate 250 MHz for use on a co-primary basis by MSS feeder links and GSO/FSS satellites, in order to allow MSS feeder link operations in 200 MHz of contiguous spectrum from 29.1 to 29.3 MHz, and to potentially accommodate a second MSS system's feeder links. We request comment on this issue. There may still be the need for coordination between the GSO/FSS systems and the MSS feeder link earth stations in this band. Coordination will be implemented on a first-come-first-served basis. It should be noted that eight feeder link complex locations,[67] in the 28 GHz band, will be identified before any competitive bidding procedures begin. Based on applicants' stated plans, these complexes are likely to specify 50 MHz of spectrum at 29.25-29.3 GHz.

c. Uplinks for MSS feeder Links and Downlinks for NGSO and GSO FSS Systems in the 19.3-19.7 GHz Band

65. The downlink spectrum conventionally paired with the satellite allocation in the 27.5-29.5 GHz band is at 17.7-20.2 GHz. The conventionally paired downlink spectrum associated with the MSS feeder link uplink spectrum at 29.1-29.5 GHz is at 19.3-19.7 GHz. The Commission has developed proposals concerning both the 29.1-29.5 GHz and 19.3-19.7 GHz band as part of the preparations for the upcoming World Radiocommunication Conference (WRC-95).[68] In addition to proposing regulatory changes necessary to facilitate NGSO downlink operations for MSS feeder links in the 19.3-19.7 GHz band, the Commission has also proposed changes to the international allocation at 19.4-19.7 GHz that would facilitate NGSO MSS feeder uplink operations.[69] If this proposal is adopted at WRC-95, co-frequency sharing between NGSO and GSO operations will be considerably more complicated within this band.[70] In order to address this possibility, we specifically seek comment on whether we should designate the 18.3-18.55 GHz downlink band for pairing with the GSO

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[67] *See* definition of "feeder link earth station complex," *supra* at note 65.

[68] *See* WRC Preparatory Report, FCC 95-256 (released June 15, 1995).

[69] *See* WRC Preparatory Report at Appendix 1, Proposals USA/ /28-31. The proposal for MSS feeder uplinks at 19.4-19.7 GHz is intended to be paired with MSS feeder downlinks at 15.45-15.65 GHz. *Id.* at Appendix 1, Proposals USA//21-26.

[70] *See* CPM Report at Chapter 2, Section 1, Part C, §3.2.5.